whereby the polarization direction of the at least two of said plurality of vertical cavity surface emitting laser elements remain substantially constant during operation.

REPLY

The Examiner rejected claims 1-38 under 35 USC §112, second paragraph, as being indefinite. The Examiner indicated that in claim 1, the phrase "two or more VCSEL element" renders the claim indefinite. Regarding claims 21 and 22, the Examiner indicated that the phrase "polarization-stable VCSEL device" renders the claim indefinite. Regarding claim 35, the Examiner indicated the phrase "a first mirror" and "a second mirror" renders the claim indefinite.

The Examiner rejected claims 1-38 under 35 USC §102(b) as being anticipated by Thornton.

The claims have been amended to render them definite. Claim 1 has been amended to recite "forming a plurality of VCSEL elements … arranged to allow phase coupling between at least two of the plurality of VCSEL elements". Claim 1 should now be definite and it should now be clear that the plurality of VCSEL elements are arranged to allow phase coupling therebetween.

Claims 6 and 12 have been amended to conform them to the amendments made in claim 1.

Claim 21 has been amended to recite, "two to five phase-coupled VCSEL elements placed in an array". It should now be clear that the arrangement of the two to five phase-coupled VCSEL elements are in an array.

Claim 22 has been similarly amended.

Claim 35 has been amended to delete reference to a first and second mirror. Claim 35 should now be definite.

Thornton discloses a vertical cavity surface emitting laser device capable of emitting a selected wavelength and selected polarization, with the polarization established by a stress inducing element. The beams of the lasers are each differentiable from the others by a unique combination of wavelengths and polarization. *Thornton, column 3, lines 24-26.* Therefore, the vertical cavity surface emitting laser device disclosed in Thornton is not phase-coupled. There is no indication in Thornton at all to indicate that the individual lasers 100, 102, 104, and 106 are phase-coupled. These lasers are separated by a relatively large space or gap and therefore are intended to operate independently. An aspect of the invention disclosed in Thornton is that the lasers are discrete and separable.

Thornton does not disclose or suggest providing a phase-coupled radiation field of individual laser elements, as claimed in the present invention, but instead points out that the laser elements are separated by trenches so that phase coupling is

prevented. Thornton specifically teaches isolation regions 130 that serve to provide electrical isolation between the individual devices in the array. *Thornton, column 5, lines 43-47.*

The present invention utilizes phase coupling to link the different VCSEL elements to provide a polarization direction of the elements that remain substantially constant during operation. Therefore, spontaneous polarization flips encountered in prior art devices are avoided.

Claim 1 recites the step of forming a plurality of VCSEL elements arranged to allow phase coupling between at least two of the plurality of VCSEL elements. This step of forming a plurality of VCSEL elements that are phase-coupled is not disclosed in Thornton and, therefore, cannot have been anticipated thereby.

Claim 21 has been amended to recite "a phase coupling region placed between the phase coupled VCSEL elements." A phase coupling region utilized to link the different VCSEL elements together is not disclosed or suggested in Thornton. Thornton actually teaches away from the coupling of the different lasers in that each of the different lasers disclosed in Thornton are isolated and intended to operate separately and distinctly at different polarizations and wavelengths.

Claim 22 has been amended to recite "a phase coupling region placed between each of said plurality of phase coupled VCSEL elements, where during operation the polarization direction of

each of the VCSEL elements remains substantially constant in a predefined polarization direction due to the phase coupling of the VCSEL elements". As indicated above, these elements and features are not disclosed at all in Thornton.

Claims 39-44 have been added to more particularly emphasize the features of the present invention. Claim 39 recites "a phase coupling region separating each of said plurality of vertical cavity surface emitting laser elements". Claim 44 recites, "phase coupling at least two of the plurality of vertical cavity surface emitting laser elements".

Accordingly, it is respectfully requested that the Examiner reconsider the present application and indicate allowable subject matter.

Respectfully submitted,

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MARKED-UP VERSION

In the Specification

Page 1, after the title and before the first paragraph, insert the heading --Field of the Invention--.

Page 1, before the second paragraph, insert the heading --Background of the Invention--.

Page 3, before the second paragraph, insert the heading --Summary of the Invention--.

Page 11, between lines 19 and 20 and before the paragraph starting on line 20, insert the heading --Brief Description of the Drawings--.

Page 12, between lines 5 and 6 and before the paragraph starting on line 6, insert the heading --Detailed Description of the Preferred Embodiments--.

Page 19, before claim 1 insert the heading --What is claimed is:--.

Page 25, line 1, [ABSTRACT] Abstract of the Disclosure.

In the claims

1. (Once Amended) A method of stabilizing the polarization of a vertical cavity surface emitting laser (VCSEL) device, comprising:

[providing two or more] forming a plurality of VCSEL elements capable of emitting substantially a single mode radiation of substantiall the same wavelength and arranged to allow phase coupling between [the two or more] at least two of the plurality of VCSEL elements, and

initiating emission of radiation by injecting current into the [two or more] at least two of the plurality of VCSEL elements to produce phase-coupled radiation, wherein the polarization direction of each of the [two or more] at lease two of the plurality of VCSEL elements remains substantially constant during operation.

6. (Once Amended) The method of claim 1, wherein [said two or more] the at least two of the plurality of VCSEL elements are top-emitting VCSEL elements.

12. (Once Amended) The method of claim 1, wherein [said two or more] the at least two of the plurality of VCSEL elements are arranged as an array defined by a phase-coupling region formed on top of a top Bragg reflector of the VCSEL device.

21. (Once Amended) A polarization-stable VCSEL device comprising:

[an arrangement] two to five phase-coupled VCSEL elements placed in an array;

a phase-coupling region placed between the phase-coupled VCSEL elements,

wherein, during operation, the polarization direction of each of the VCSEL elements remains substantially constant due to the phase-coupling of the VCSEL elements.

22. (Once Amended) A polarization-stable VCSEL device comprising:

a plurality of phase-coupled VCSEL elements placed in an array;

a phase-coupling region placed between each of said plurality of phase-coupled VCSEL elements, wherein during operation the polarization direction of each of the VCSEL elements remains substantially constant in a pre-defined

polarization direction due to the phase-coupling of the VCSEL elements; and

a polarization adjusting means provided in one or more of the phase-coupled VCSEL elements to select [a] the pre-defined polarization direction.

35. (Once Amended) The polarization-stable VCSEL device of claim 21 further comprising a grid layer [arranged between a first mirror means and a second mirror means forming a resonator of the VCSEL device].